Alternative Transportation Fuels: A Current Snapshot

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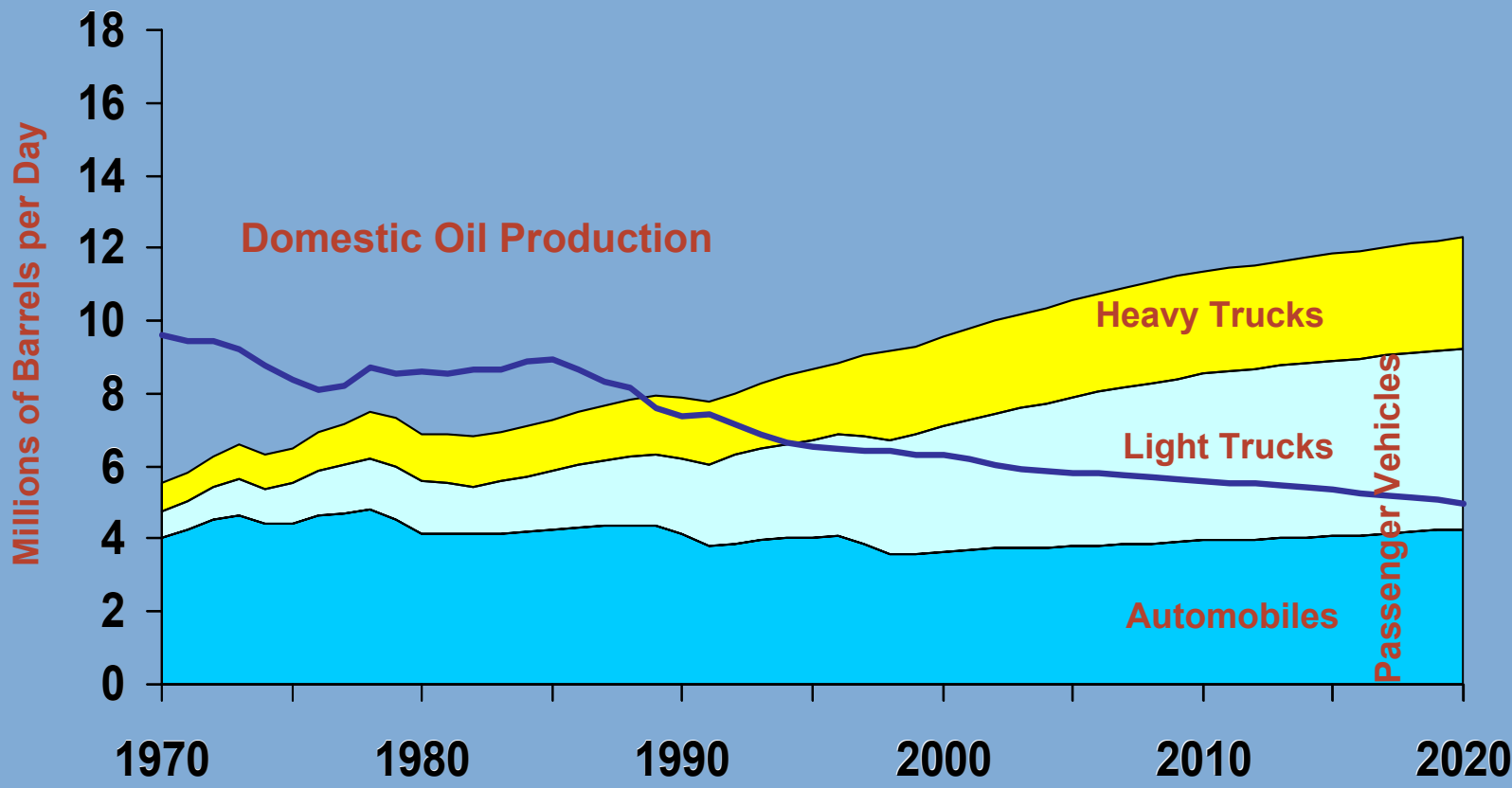
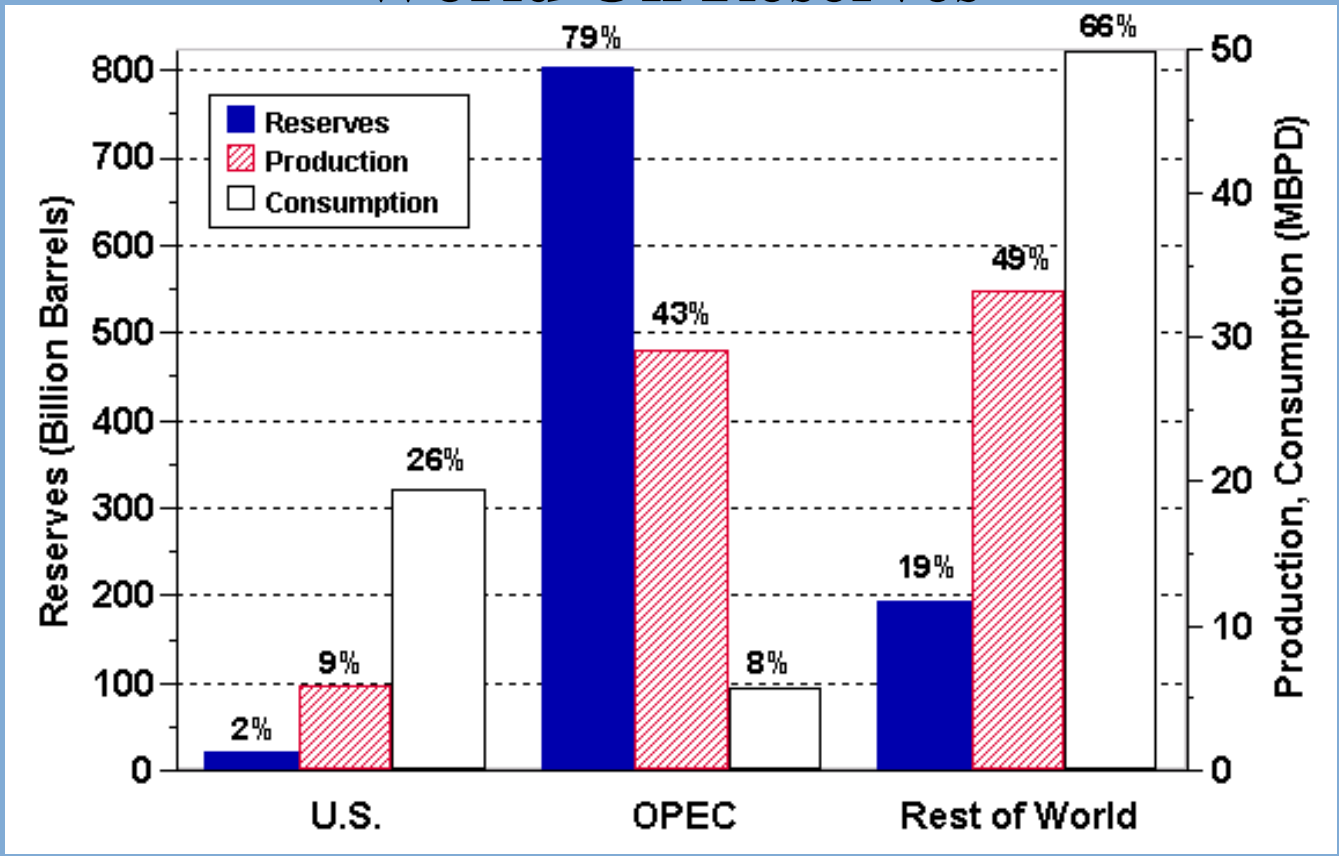
Overview:

- Policy Drivers for Alternative Fuel Use
- Clean Cities/Expanded Portfolio
- Trends in Alternative Fuel Use
- Ethanol as a Transportation Fuel
- Biodiesel
- Issues/Barriers
- Information Resources

The Oil Gap


Millions of Barrels per Day
18
16
14
12
10
8
6
4
2
0
1970
1980
1990
2000
2010
2020
Domestic Oil Production
Heavy Trucks
Light Trucks
Automobiles
Passenger Vehicles

The U.S. Accounts for 26% of World Oil Consumption and 9% of World Oil Production, but Has Only 2% of World Oil Reserves



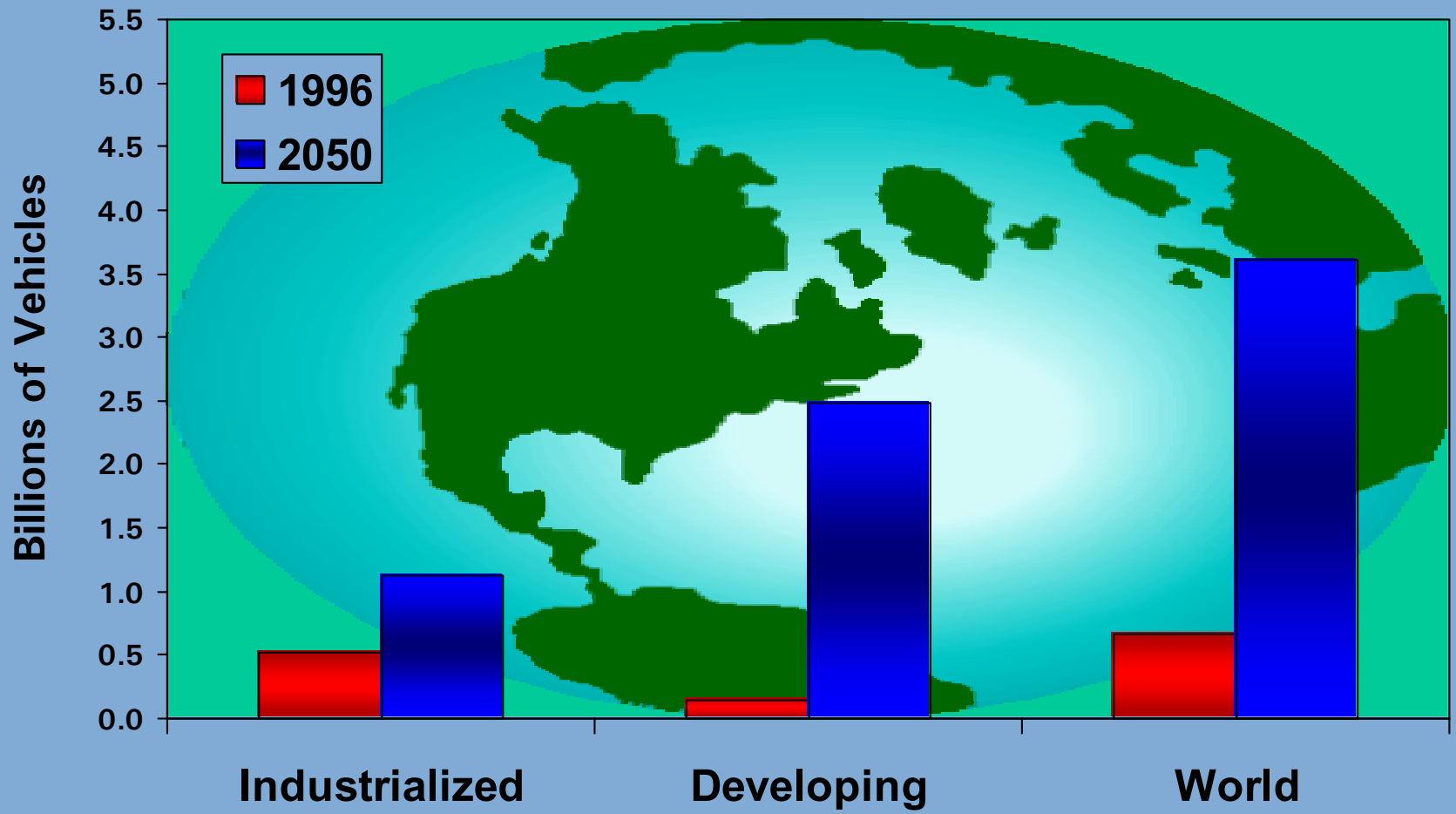
U.S. Energy Concerns

- **The U.S. imports more than 50 % of its crude oil and is expected to import more than 60% by 2010.**
- **U.S. Consumers pay foreign countries over two billion dollars a week to satisfy the demand for imported oil**
- **Much of our oil is imported from politically unstable areas of the world.**

Health Effects of Vehicle Emissions

- **Vehicles account for a third of our nation's air pollution**
- **Increase in asthma, premature deaths, & lost work days attributed to poor air quality cost several trillion dollars per year.**
- **In CA, 70% of cancer risk from air pollution attributed to diesel**
- **Air pollution is estimated to contribute to 50,000-120,000 premature deaths per year.**

Vehicle Numbers



Source: EE Analytic Team

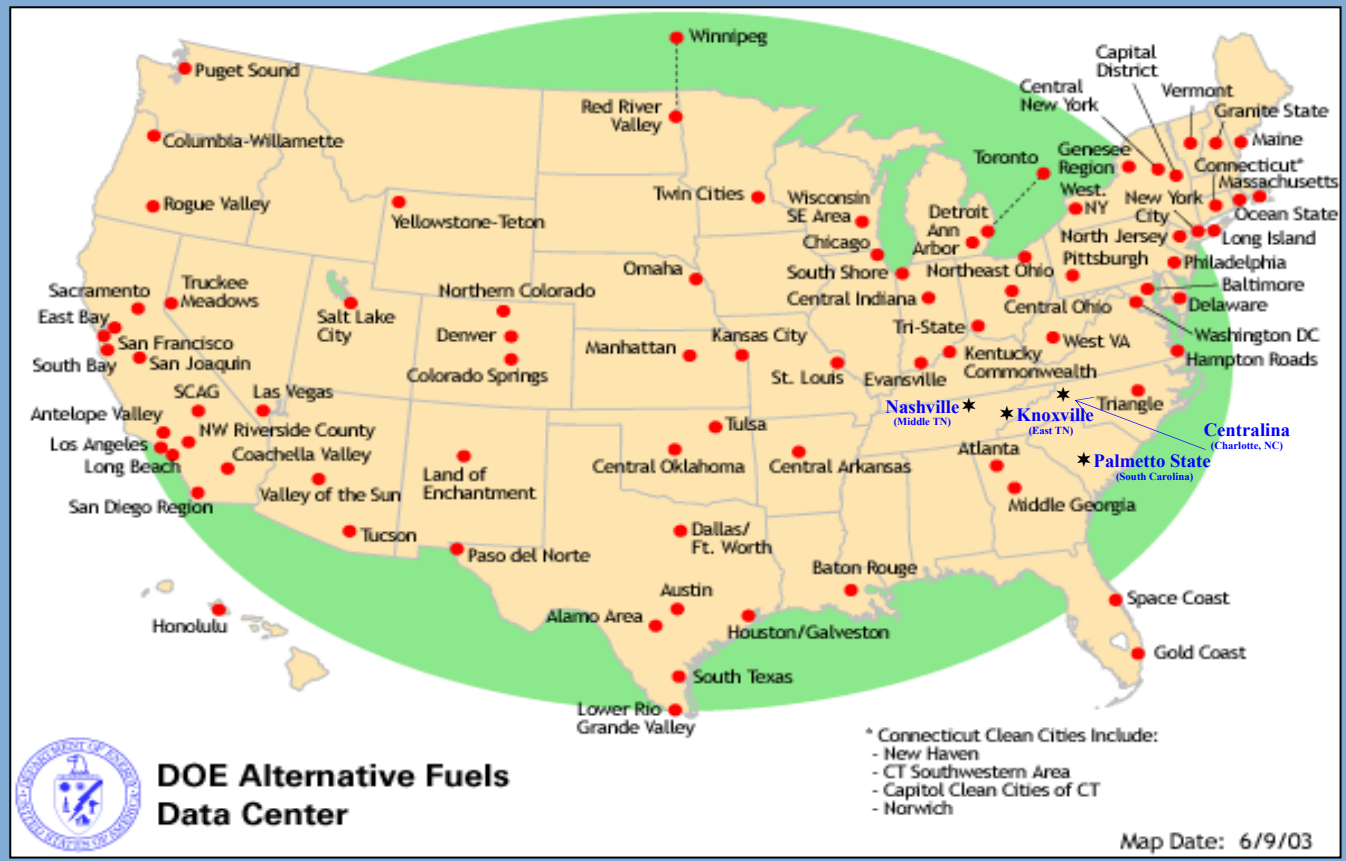
Imports Drain Economy/ Domestic Fuels Boost

- U.S. Spends > $1 Bill/week on Imported Oil
- OPEC Supplies About 46% of Imports
- OPEC Supplies About 25% of Total US Energy
- ***Renewable Fuels Such as Ethanol and Biodiesel can reverse this trend and boost the farm economy.***

Summary of Energy Policy Drivers

- National security and the need to reduce oil imports and expand energy supply diversity
- Air quality: the need to reduce criteria pollutants and greenhouse gas emissions
- Public Health
- Improved energy efficiency/Economics
- Economic Reasons

Significant Growth in the Southeast Region in 2004



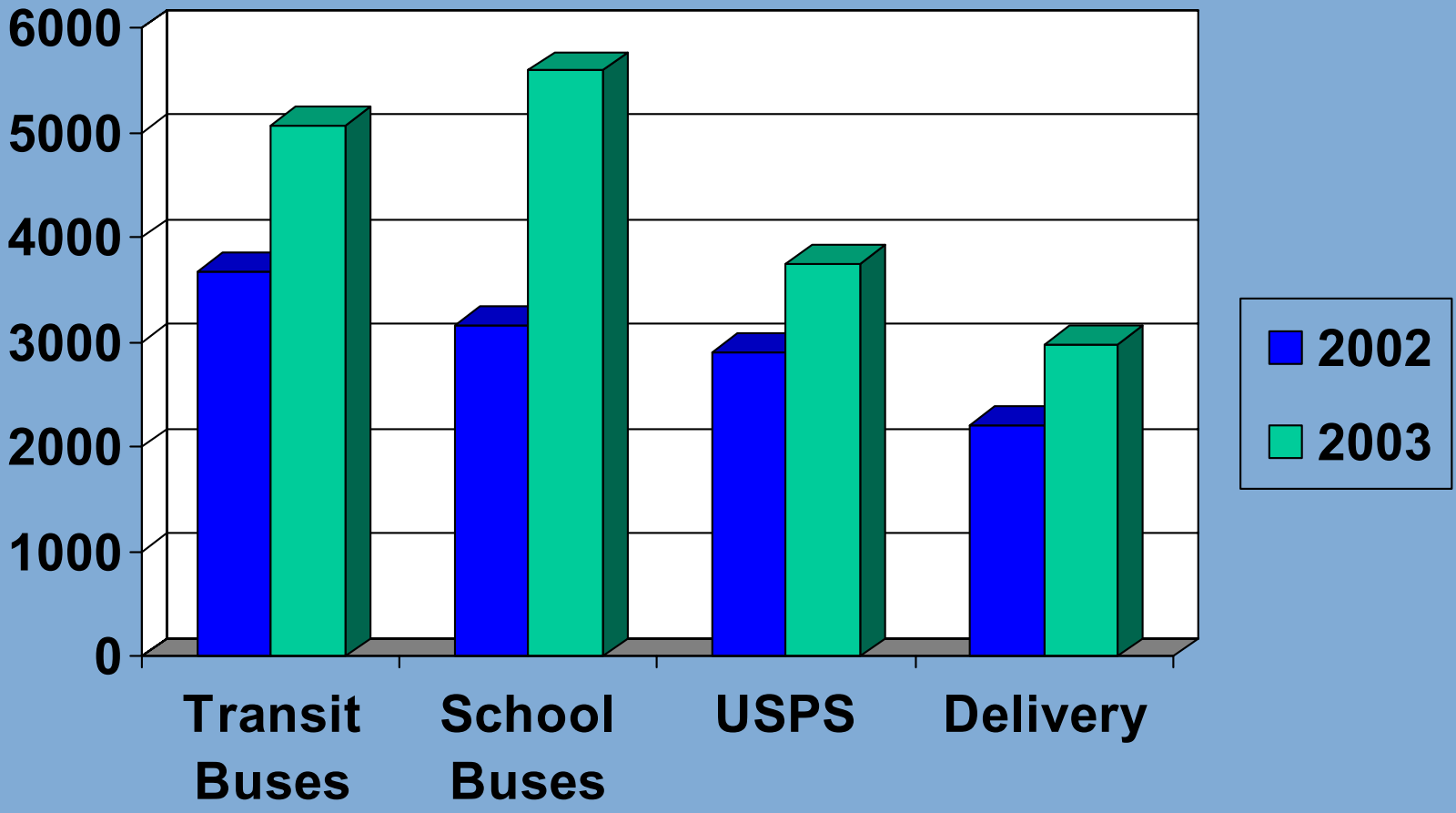
Palmetto State Clean Fuels Coalition

- Coalition Support
- Schwan's Home Service
- USC Ethanol Infrastructure
- Alternative Futures/United Energy

Expanded Portfolio for Clean Cities

1. AFVs
2. Idle Reduction
3. Blends
4. Hybrids
5. Fuel Economy

AFV Niche Markets Trends



Alternative Fuel Use in the U.S.

Fuel	2001	2002	2003
Biodiesel (B100) millions of gallons	5	15	25
E85 Million gges	15	18	20
CNG Million gges	104	121	142
LNG Million gges	9	9	11
Propane Million gges	216	223	230

Current Alternative Fuel Prices & Variables

- B100 - $2.57
- B20 - $1.66
- CNG - $1.51
- E85 - $2.28
- E/V - $2.28
- LPG - $2.25

(Retail in gasoline gallon equivalents)

Expanded Portfolio and Trends

- Hybrids
- Blends
- Fuel Economy
- Idle Reduction
- Collaboration between FHA, EPA, and DOE
- Rapid Expansion of Biodiesel Use and E85

What is Ethanol?

- Ethyl alcohol, grain alcohol, EtOH is a clear, colorless liquid which may be denatured to use as a motor fuel. Ethanol is ethane with a hydrogen molecule replaced by a hydroxyl radical (CH3CH2-OH or C2H5-OH)
- ADM, “a cleaner burning fuel, MADE FROM CORN…”

Ethanol Fuel Characteristics

- Freezing point –173 F > -40F for #2 diesel
- (R + M) / 2 Octane Number 100 > 86-94 for gasoline
- BTU Content 76,000 BTU/G < 114,000 BTU/G for gasoline
- ASTM D4806, “an anhydrous denatured fuel”
- May contain detergents &/or corrosion inhibiting additives

Value of Ethanol

Three Primary Uses:

- as an OXYGENATE
- as OCTANE
- as ALTERNATIVE TRANSPORTATION FUEL

Value of Ethanol

- Octane booster, 10% ethanol = + 2 Octane rating
- E85 is Epact compliant alternative fuel w. 80% less air toxics (benzene, xylene, sulfur,etc.) than gasoline for use in Flex-fuel vehicles (FFVs)
- Renewable
- Reduces greenhouse gas emissions & toxics
- Does not reduce Nox

Flex-fuel Vehicles (FFVs)

- FFVs may use any mix of gasoline or E85 – from 100% unleaded gasoline to 100% E85
- FFVs experience a mileage reduction on E85 vs gasoline (roughly 27%)
- Flexible fuel vehicle (FFV) specially designed to run on any ethanol blend up to 85%.
- The computer adjusts the FFVs fuel injection and ignition timing to compensate for different fuel mixtures.

Incentives per 2007

- $0.52/gal. E100 tax credit (Blenders>Producers)
- < 30 M gal. Production-- $0.62 for up 15M gal or $0.52/gal excise tax exemption
- Possible renewable fuels standard (RFS)
- Possible ban on MTBE

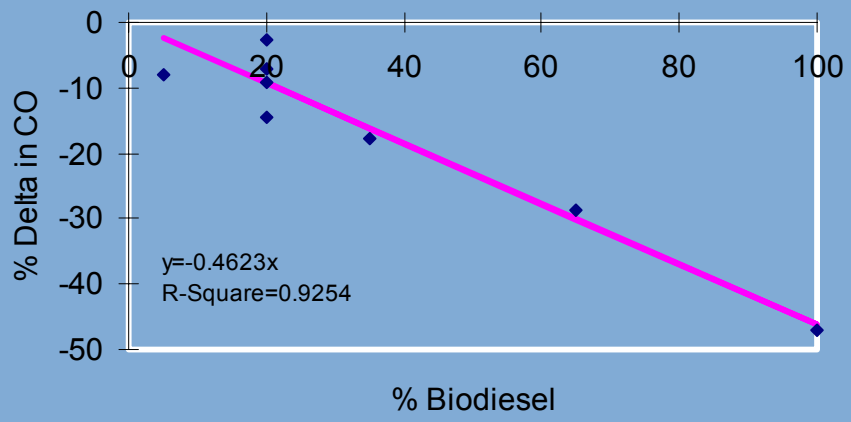
What is Biodiesel?

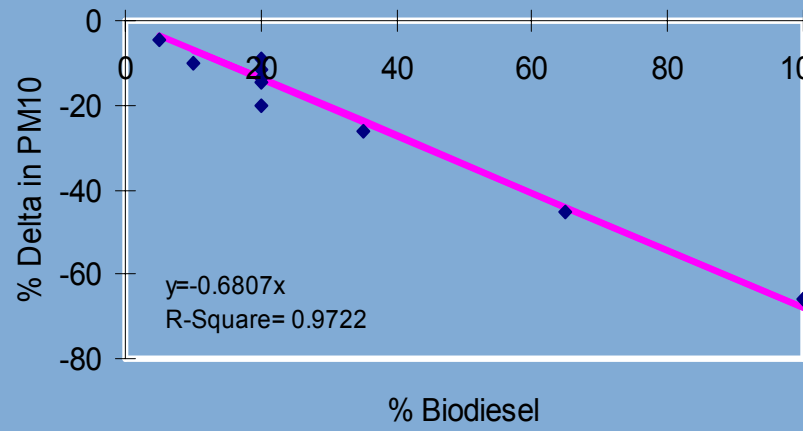
- Defined by ASTM, EPA and DOE and by each State's Weights and Measures Agency or State Regulations
  - "A fuel consisting of long-chain fatty acid alkyl esters made from renewable vegetable oils, recycled cooking greases, or animal fats " that meets ASTM standards ASTM D6751
- A high Btu renewable fuel with properties similar to No. 2 petroleum diesel fuel

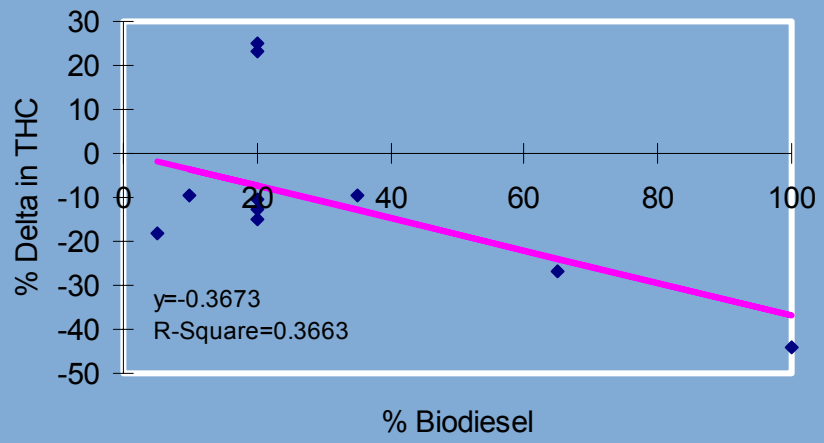
Fuel Characteristics

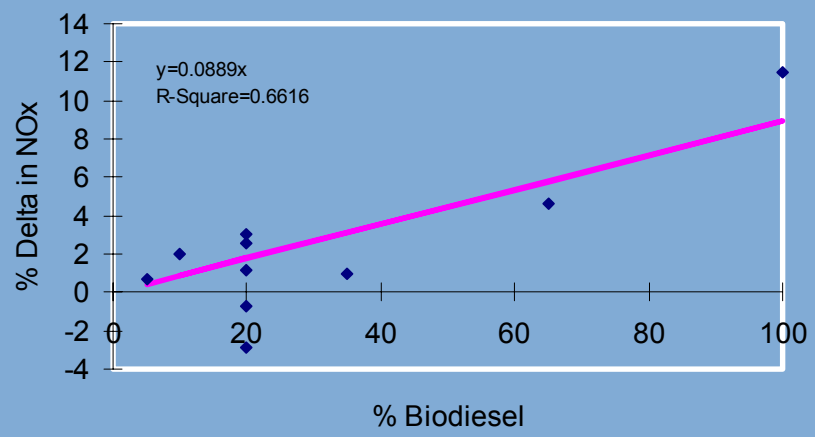
- BTU Content 121,000 BTU/gal c.f. 131,000 BTU/gal for #2 Diesel
- Completely miscible with petroleum diesel
- High lubricity
- High Flash Point 179 C; 354 F; vs. 74 C; 165 F for #2 Diesel
- High oxygen content (11% for soy methyl ester)

Reduces CO, HC, PM



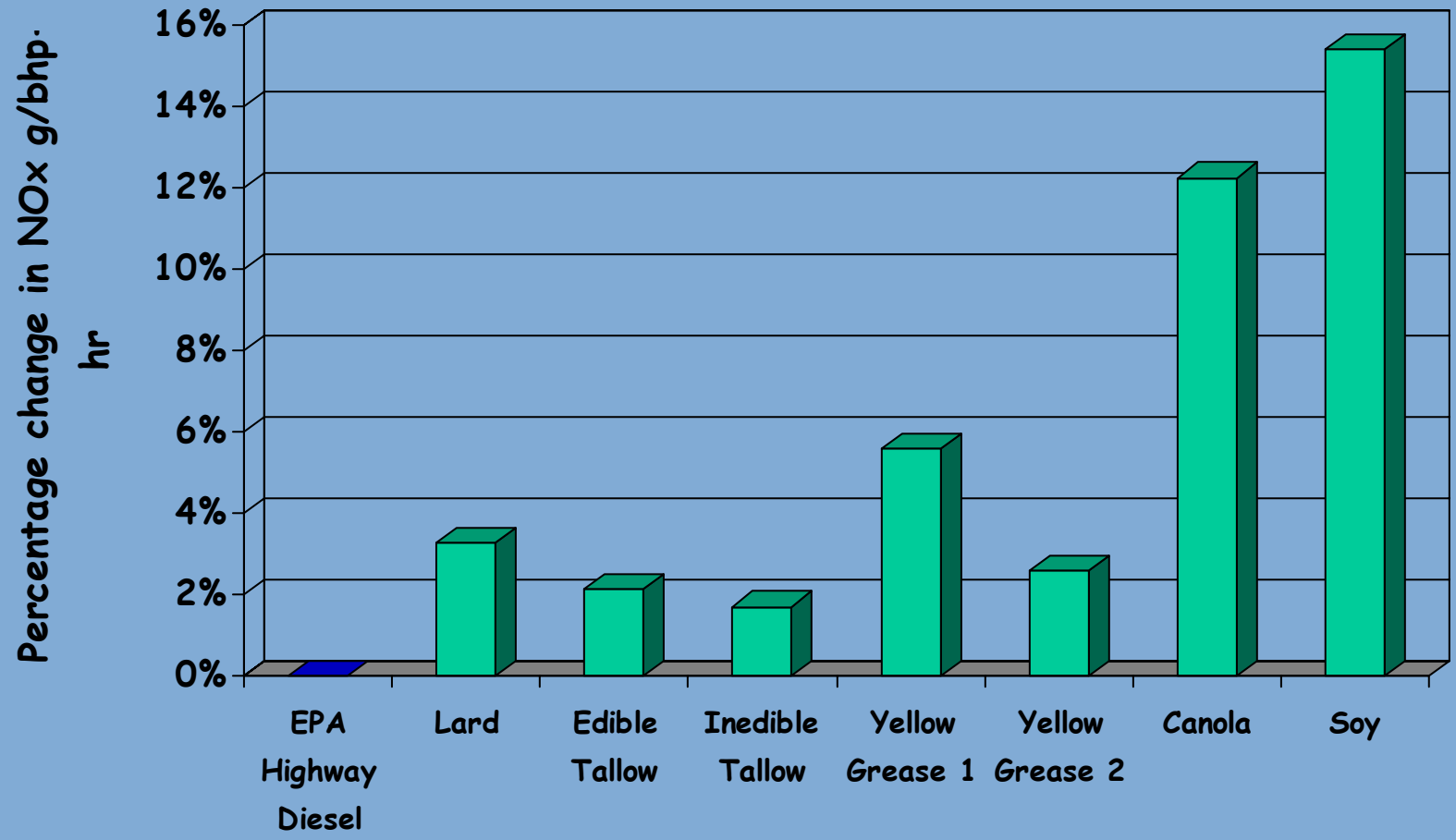






Information from Dr. Shaine Tyson, NREL.

Biodiesel (B100) NOx Emissions



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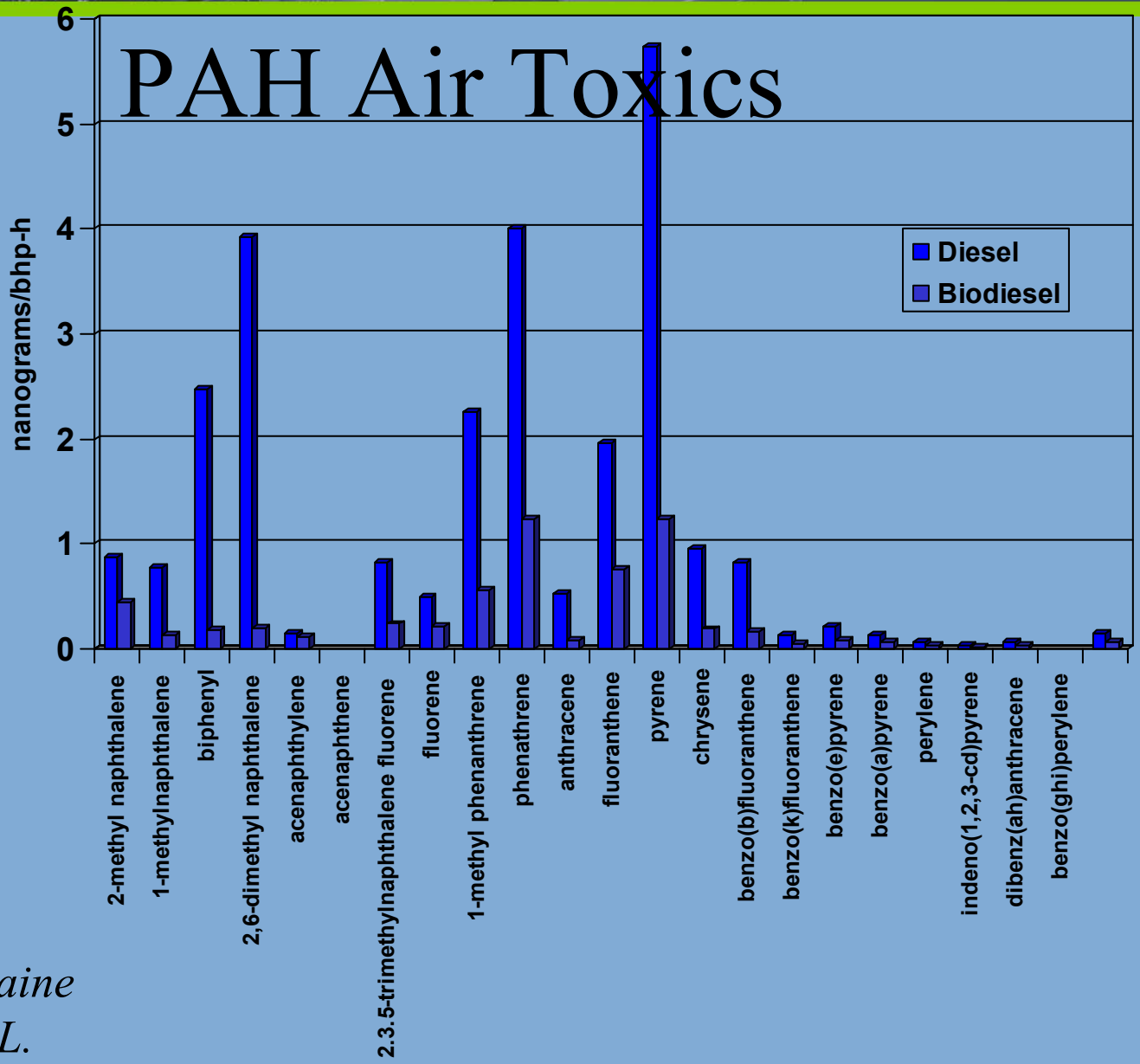
PAH Air Toxics



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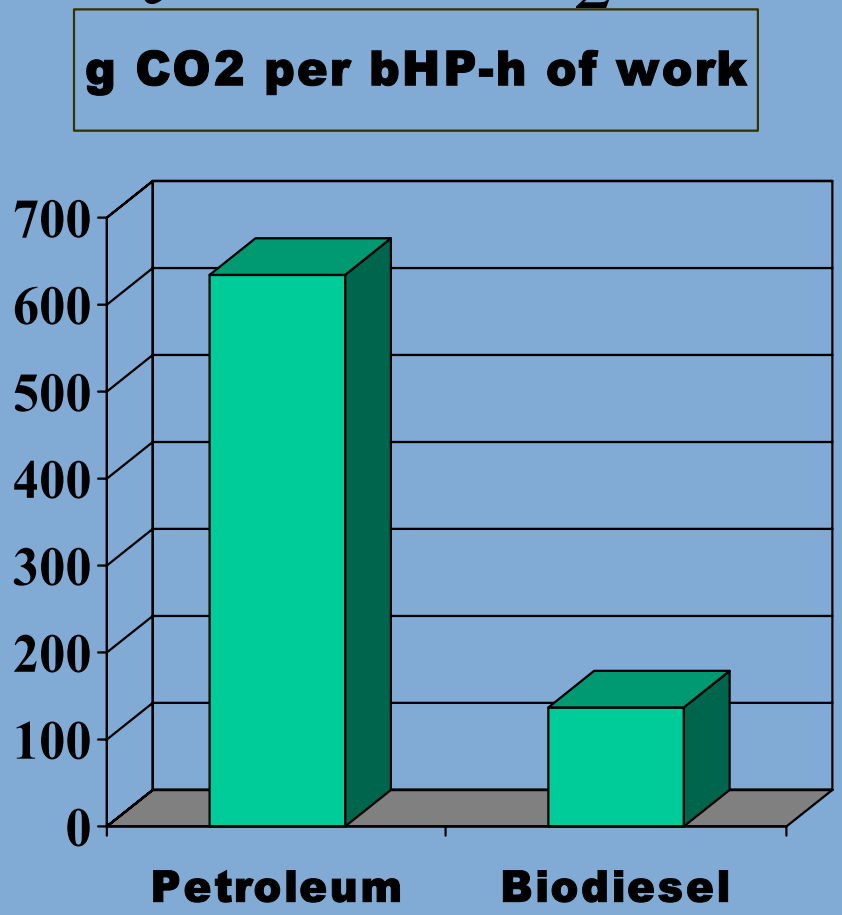
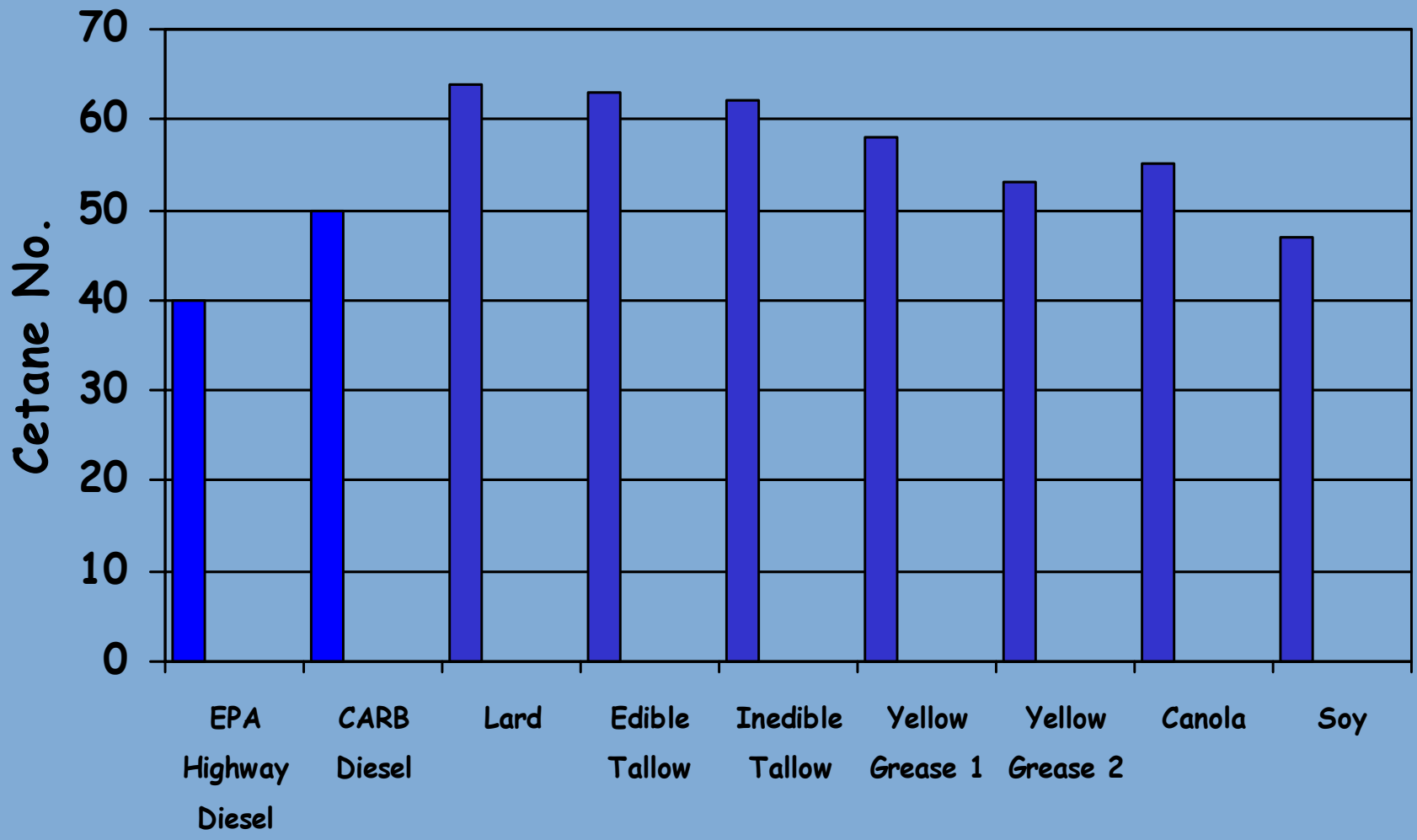
Recycles CO_2



- Biodiesel emits 78.5% less CO_2 than petroleum diesel
- Blends exhibit proportionate benefits
  - B20 emits 15.66% less CO_2 than petroleum diesel

Biodiesel Cetane No.



Other Benefits of Biodiesel

- Use B20 in any diesel engine w/o modifications
- Biodegradable
- Non-Toxic
- Less Polluting—compatible with control technologies
- Utilizes waste streams
- Renewable
- Economic Development

EPAct Credits

- 5 vehicles using B20 = 1 using B100
- 2,250 gals. B20 or 450 gals. B100 = 1 credit
- Biodiesel credits are not bankable or tradeable, but can offset AFV requirements for covered fleets which can then be sold
- 1 HDV (26,000 lbs.) counts as 5 LDV for fleet compliance reporting
- For more EPAct information, call the EPAct hotline: 202-586-9171

Warranties and Pricing

- Use ASTM Specification D6751 Fuel
- Fuel provider may be held accountable for problems
- http://www.afdc.doe.gov/periodicals.html for price reports

Other Considerations

- Shelf life of B100
- Microbial contamination
- Solvent
- Fuel filters
- Risks to hoses and gaskets (B100)
- Cold weather issues-10 degree F. cloud point

Information Resources

- Alternative Fuels Data Center (guidebook for storage and handling)
  - http://www.afdc.doe.gov
- American Coalition for Ethanol http://www.ethanol.org/
- National Ethanol Vehicle Coalition http://www.e85fuel.com/

Information Resources

- National Biodiesel Board http://www.biodiesel.org/
- Alternative Fuels Data Center
  - http://www.afdc.nrel.gov/fleet_provider.html
  - Epact Credits and Reporting
  - Periodicals and Newsletters
  - Guidebook for State and Alternative Fuel Provider Fleets
- World Energy http://www.worldenergy.net/
- Griffin Industries http://www.griffinind.com
- K. Shaine Tyson and Robert McCormick
  - www.ott.doe.gov/biofuels
  - 303-275-4616 Tyson 202-275-4432 McCormick

Issues/Barriers

- Legislative Uncertainties
- Sustainable Business Models
- Uneven Utility of Incentives
- Incremental Cost
- Volatility of Feedstock Prices
- Distribution Systems
- Public Acceptance

Problems?

Only Minor Problems

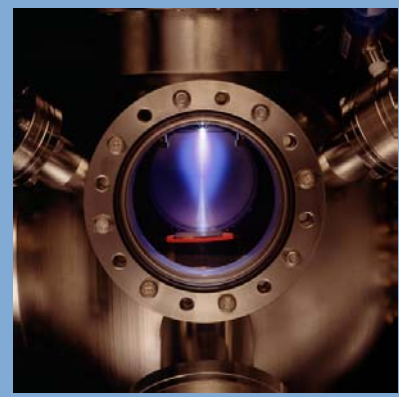
U.S. Department of Energy
Energy Efficiency and Renewable Energy

Clean Cities

Office of Energy Efficiency and Renewable Energy

http://www.eere.energy.gov



Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable